What is claimed is:

1.   A method for indexing feature vector data space comprising the step of:

(a) adaptively approximating feature vectors on the basis of statistical distribution of feature vector data in the feature vector data

5   space.

2.   The method of claim 1, wherein the step (a) further comprises the steps of:

(a-1) measuring the statistical distribution of the feature vector data in the feature vector data space;

5   (a-2) estimating marginal distribution of the feature vector data using the statistical distribution;

(a-3) dividing the estimated marginal distribution into a plurality of grids in which a probability of disposing the feature vector data in each grid is uniform; and

10   (a-4) indexing the feature vector data space using the divided grids.

3.   The method of claim 2, further comprising prior to step (a-4), the step of updating the grids on the basis of a previous probability distribution function and an updated probability distribution function, when new data is received.

4.   The method of claim 2, wherein step (a-4) further comprises indexing using vector approximation (VA) files.

5.   The method of claim 2, wherein a number of the plurality of grids is determined by a number of bits assigned to the dimension.

6.   The method of claim 2, wherein step (a-2) further comprises the steps of:

(a-2-1) defining a probability distribution function using a weighted sum of a predetermined distribution function; and

(a-2-2) obtaining an estimated probability distribution function by estimating predetermined parameters using the probability distribution function defined in the step (a-2-1).

7.   The method of claim 6, wherein step (a-2-2) further comprises obtaining the estimated probability distribution function by estimating the predetermined parameters using all N predetermined data in each estimation, wherein N is a positive integer, on the basis of an expectation-maximization algorithm using the probability distribution function defined in the step (a-2-1).

8.   The method of claim 6, wherein the predetermined distribution function is the Gaussian function.

9.	The method of claim 6, wherein the probability distribution function of step (a-2-1) is a one-dimensional signal, p(x), wherein

$$p(x) = \sum_{j=1}^{N} p(x|j)P(j),$$ and wherein $p(x|j)$ is defined as

$$p(x|j) = \frac{1}{\sqrt{2\pi\sigma^2}} \exp\left\{ -\frac{(x-\mu_j)^2}{2\sigma_j^2} \right\},$$

5	wherein coefficient P(j) is a mixing parameter that satisfies the

following criterion $0 \leq P(j) \leq 1$ and $\sum_{j=1}^{M} P(j) = 1$.

10.	The method of claim 6, wherein the estimated probability distribution function of step (a-2-2) is obtained by finding Φj, $j=1,\ldots,M$,

which maximizes $\Phi(\Phi_1,\ldots,\Phi_M) = \prod_{l=0}^{N} P(v[l]|(\Phi_1,\ldots,\Phi_M))$, where

parameters v[l], l=1,…,N, is a given data set.

11.	The method of claim 10, wherein the estimated parameters of step (a-2-2) are updated according to the following

equations	$\mu_j^{t+1} = \dfrac{\sum\limits_{l=1}^{N} p(j|v[l])^t v[l]}{\sum\limits_{l=1}^{N} p(j|v[l])^t}$,

$(\sigma_j^2)^{t+1} = \dfrac{\sum\limits_{l=1}^{N} p(j|v[l])^t (v[l] - \mu_j^t)^2}{\sum\limits_{l=1}^{N} p(j|v[l])^t}$, and

$$P(j)^{t+1} = \frac{1}{N}\sum_{l=1}^{N} p(j|v[l])^t ,$$ wherein t is a positive integer

representing a number of iterations.

12.   The method of claim 11, wherein the estimated

parameter set of step (a-2-2) using N data v[l] is given as

$\{P(j)^N \mu_j^N, (\sigma_j^2)^N\}$, and the updated parameter set for new data v[N+1],

coming in, is calculating using the following equations:

$$\mu_j^{N+1} = \mu_j^N + \theta_j^{N+1}(v[N+1] - \mu_j^N),$$

$$(\sigma_j^2)^{N+1} = (\sigma_j^2)^N + \theta_j^{N+1}[(v[N+1] - \mu_j^N)^2 - (\sigma_j^2)^N],$$

$$P(j)^{N+1} = P(j)^N + \frac{1}{N+1}(P(j|v[N+1]) - P(j)^N),$$ and

$$(\theta_j^{N+1})^{-1} = \frac{P(j|v[N])}{P(j|v[N+1])}(\theta_j^N)^{-1} + 1.$$

13.   The method of claim 11, wherein the step (a-2-2) further

comprises:

measuring a change of a probability distribution function which is

defined as $\rho = \dfrac{\int(\hat{p}_{old}(x) - \hat{p}_{new}(x))^2 dx}{\int \hat{p}_{old}(x)^2 dx}$ for each dimension, wherein a

5   previous probability distribution function is $\hat{P}_{old}(x)$, and an updated

probability distribution function is $\hat{P}_{new}(x)$; and

     updating an approximation for the dimension if ρ is larger than a
predetermined threshold value.

     14.   The method of claim 2, wherein step (a-3) further

comprises dividing a probability distribution function into the plurality of

grids to make areas covered by each grid equal, wherein the plurality

of grids have boundary points defined by c[l], l = 0,...,2^b, where b is a

5   number of bits allocated and wherein the boundary points satisfy a

criterion, $\int_{c[l]}^{c[l+1]} \hat{p}(x)dx = \frac{1}{2^b}\int_{c[0]}^{c[2^b]} \hat{p}(x)dx$, and wherein the estimated

probability distribution function is $\hat{p}(x)$.